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Improving RIAs (Regulatory Impact Analyses) Suggestions for the Analysis of Hazardous Waste Regulations Executive Summary

Research Triangle Inst.
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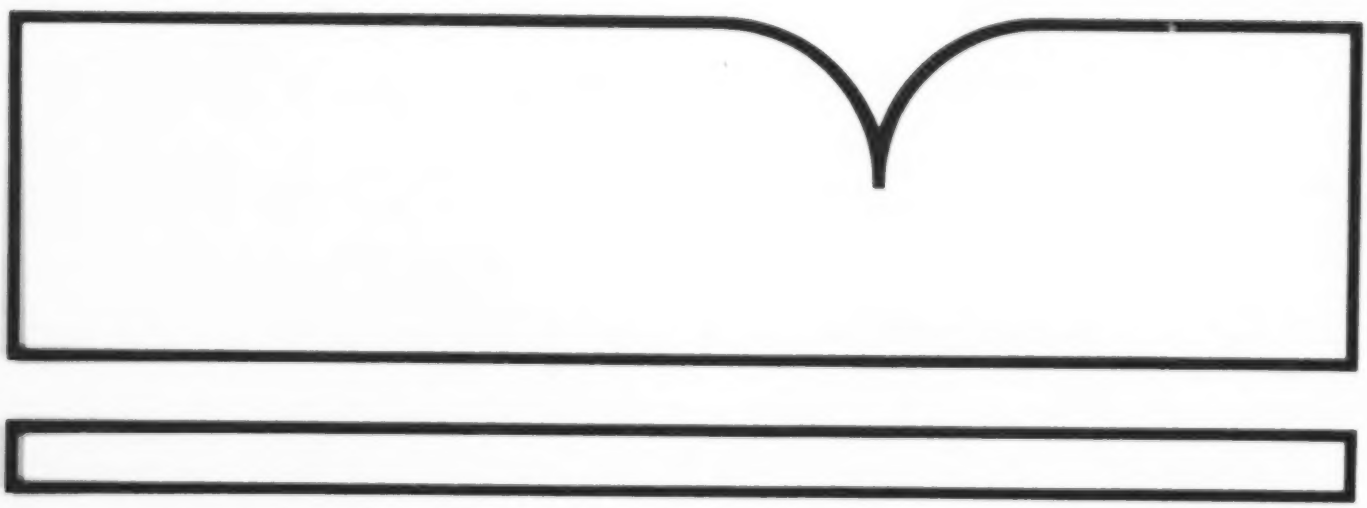

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16. Abstract (Limit: 200 words)

This report reviews the components required in a regulatory impact analysis (RIA) of major federal regulations. Eight recent hazardous waste RIAs then are evaluated in terms of how well they meet these requirements. Twelve specific recommendations are provided for improving the usefulness of hazardous waste RIAs in the regulatory decision process.

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Improving RIAs: Suggestions for the Analysis of Hazardous Waste Regulations

EXECUTIVE SUMMARY

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EXECUTIVE SUMMARY

ES.1 FRAMEWORK FOR ANALYSIS

Executive Order 12291, issued by President Reagan on February 17, 1981, requires that Federal agencies prepare a regulatory impact analysis (RIA) for their new major regulations. The intent of this order was to ensure that regulations would be subject to a rigorous benefit-cost analysis before they could be promulgated and that alternatives to regulation would be considered. As stated in the Environmental Protection Agency (EPA) Guidelines for Performing Regulatory Impact Analyses, "...by developing and organizing information, quantifying and monetizing benefits and costs to the extent possible, and determining distributional effects and economic impacts, the RIA should provide decisionmakers with a comprehensive assessment of the implications of alternative regulatory actions." This study explores how future hazardous waste RIAs could be performed so as to provide such comprehensive information for regulatory decisionmakers.

Figure ES-1 illustrates the eight main components described by EPA for its RIAs of hazardous waste regulations as well as other environmental rulings. A hazardous waste RIA starts with a brief description of the nature of the problem the proposed regulations are designed to correct as well as the Agency's statutory authority to impose such regulations. The current and proposed regulations and other regulatory alternatives to be analyzed are presented next. Major sources of data used in the analysis are then described. Supplementary data needed for each specific estimation model used in the analysis are presented later with the estimation models.

The analysis of impacts on products markets uses an economic model to determine how the new regulations will affect the prices and quantities of various goods. Impacts on employment level and plant closures are estimated as part of this analysis. The analysis of impacts on products markets provides inputs into two further components of the RIA: estimating the benefits due to the resulting changes in exposure to hazardous substances, and estimating the costs of the new regulation due to enforcement and compliance activities.

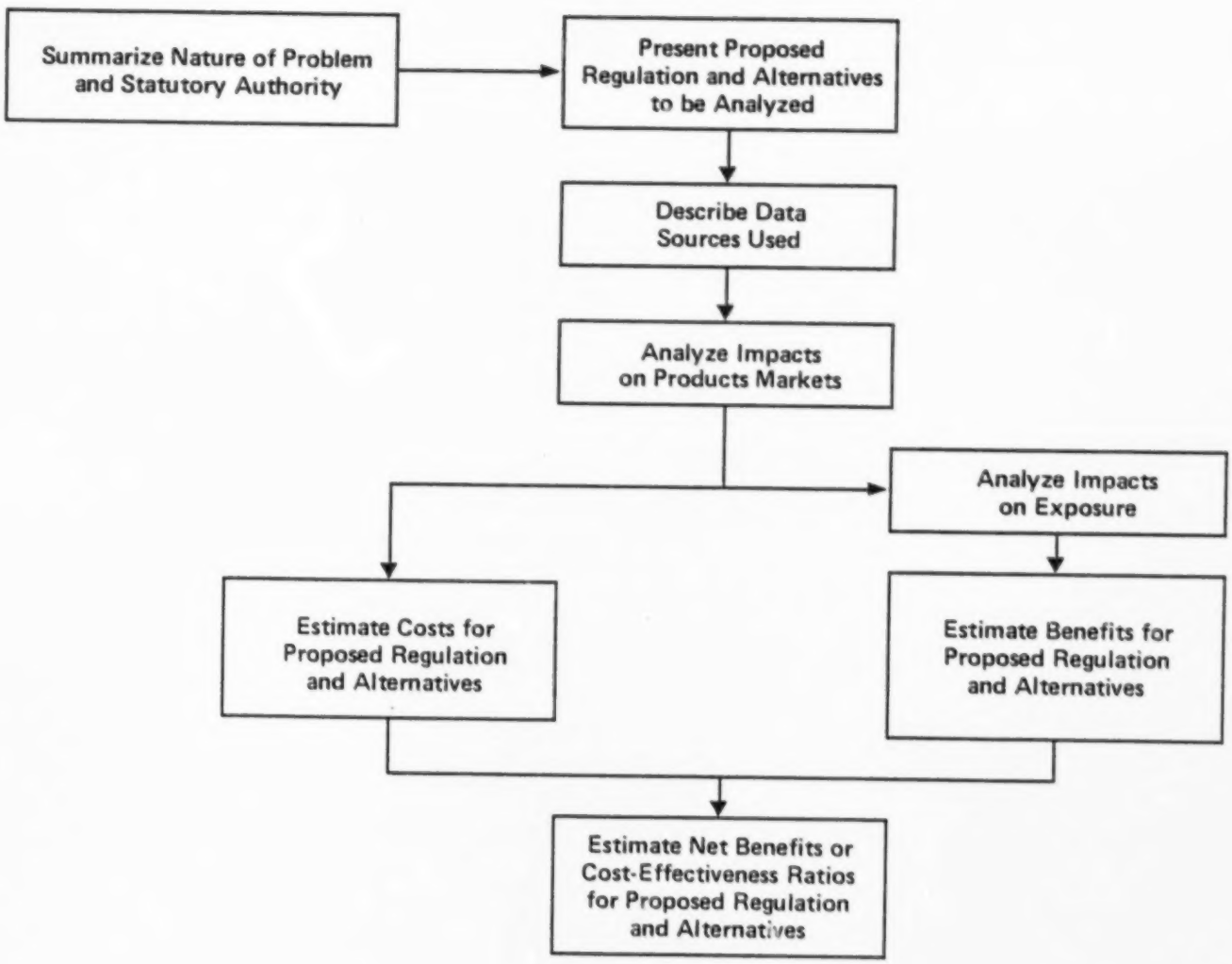
Summarize Nature of Problem and Statutory Authority
Present Proposed Regulation and Alternatives to be Analyzed
Describe Data Sources Used
Analyze Impacts on Products Markets
Analyze Impacts on Exposure
Estimate Costs for Proposed Regulation and Alternatives
Estimate Benefits for Proposed Regulation and Alternatives
Estimate Net Benefits or Cost-Effectiveness Ratios for Proposed Regulation and Alternatives

Figure ES-1. Flow chart for a hazardous waste RIA.

New regulations for managing hazardous wastes may reduce releases of the toxic substances into the environment in two ways: through the use of different disposal technologies or cleanup methods, and through reductions in the generation of hazardous wastes. The exposure analysis estimates the accompanying changes in environmental contamination and human exposure attributable to the new regulations. The results of the exposure analysis are used to estimate the benefits from regulatory action. Generally, the major benefit expected as a result of hazardous waste regulations is an improvement in health for persons at risk of exposure. Other benefits also may occur, such as fewer communities having to find alternative water supplies or engage in costly cleanup activities when aquifers become contaminated.

The promulgation of a regulation results in costs that include: increased production costs incurred by industry, increased product costs to consumers, consumer and producer surplus losses, dislocation costs from unemployment of labor and capital, and government costs from regulation. These costs are estimated using the results of the analysis of impacts on products markets. In some cases, a new regulation may result in reduced costs to producers and consumers in at least some market sectors.

The final component of the RIA compares the estimates of costs and benefits. This comparison should provide decisionmakers with a comprehensive assessment of the implications of alternative regulatory actions.

ES.2 COMPARATIVE ANALYSIS

Table ES-1 lists eight recent hazardous waste RIAs. Table ES-2 summarizes our comparative analysis of how well they satisfy the EPA guidelines for performing RIAs.

All of the RIAs include some quantitative analysis of the proposed regulation and all, except one, include some quantitative analysis of other regulatory alternatives under consideration. No RIA addresses alternatives to Federal regulation, and most do not discuss market-oriented regulatory alternatives and alternatives beyond current legislative scope.

All the RIAs use a variety of data sources, including some estimates based on informed judgment. Five of the eight perform sensitivity analysis on some or all of the variable values based on informed judgment. Half of the RIAs rely heavily on survey data to characterize the wastes, waste facilities,

TABLE ES-1. REGULATORY IMPACT ANALYSES

Abbreviated title	Full reference
1. Contingency Plan:	Regulatory Impact Analysis of the Revisions to the National Oil and Hazardous Substances Pollution Contingency Plan. ICF, Inc. For U.S. EPA, Office of Emergency and Remedial Response. 1983.
2. Used Oil:	Regulatory Impact Analysis of Proposed Standards for the Management of Used Oil. Temple, Barker, and Sloane. For U.S. EPA, Economic Analysis Branch, Office of Solid Waste. November 1985.
3. Small-Quantity Generators:	Regulatory Analysis for Proposed Regulation Under RCRA for Small Quantity Generators of Hazardous Wastes. Industrial Economics. For U.S. EPA, Office of Solid Waste, June 1985.
4. Reportable Quantities:	Regulatory Impact Analysis of Reportable Quantity Adjustments Under Sections 102 and 103 of the Comprehensive Environmental Response, Compensation, and Liability Act. ICF, Inc. For U.S. EPA, Emergency Response Division, March 1985.
5. Incineration:	Supporting Documentation for the RCRA Incinerator Regulations. PEER Consultants, for U.S. EPA, Office of Solid Waste and Emergency Response, October 1984.
6. Land ban:	Regulatory Analysis of Proposed Restrictions on Land Disposal of Hazardous Wastes. Industrial Economics, Inc. and ICF, Inc. For U.S. EPA, Office of Solid Waste. December 1985.
7. Dioxins:	Regulatory Analysis of Proposed Restrictions on Land Disposal of Certain Dioxin-Containing Wastes. Industrial Economics, Inc. For U.S. EPA, Office of Solid Waste. Draft Final Report. January 1986.
8. Solvents:	Regulatory Analysis of Proposed Restrictions on Land Disposal of Certain Solvent Wastes. Industrial Economics. For U.S. EPA, Office of Solid Waste. Draft Report. January 1986.

TABLE ES-2. SUMMARY OF COMPARATIVE ANALYSIS OF EIGHT RIAs

Topic	Contingency plan	Used oil	Small-quantity generators	Reportable quantities
Nature of problem	Releases of oil and hazardous substances to water and protection of environment when discharges do occur	Management of used oil	Disposal of hazardous waste from small-quantity generators	Releases of hazardous wastes to all environmental media from spills/accidents
Statutory authority	CERCLA	RCRA	RCRA	CERCLA
Regulatory alternatives	Some quantitative analysis for two alternative regulations	Quantitative analysis for four alternative regulations	Some quantitative analysis for six alternative regulations	Some quantitative analysis for two alternative regulations
Data sources used	Reporting data, industry data, estimates from EPA and other publications, and informed judgment; some sensitivity analysis	Industry data, estimates from EPA and other publications, and informed judgment	Reporting data, survey data, industry data, estimates from EPA and other publications, and informed judgment; some sensitivity analysis	Reporting data, survey data, case study data, industry data, estimates from EPA and other publications, and informed judgment; some sensitivity analysis
Impacts in products markets	Not estimated	Estimated percent change in prices and production levels	Not estimated because not expected to be significant	Not estimated because not expected to be significant
Exposure estimates	Number of people exposed in air, groundwater, and surface water; no exposure levels or durations	Number of people and steady-state average exposure in air, groundwater, and surface water; assumed 70-year exposure duration	Number of people and steady-state average exposure in air with 70-year exposure duration; number of people and moving average exposure in groundwater with $\leq$400 year total and 70-year individual exposure durations	None
Estimates of cancer and other harmful health effects	Discussed for typical chemicals but no quantitative estimates	Cancer cases for used oil use in 10 model facilities and national aggregates; exposure levels relative to RFD for noncarcinogens	Cancer and noncancer cases for disposal in landfills and to POTW	Discussed very briefly

(continued)

TABLE ES-2. SUMMARY OF COMPARATIVE ANALYSIS OF EIGHT RIAs (continued)

Topic	Contingency plan	Used oil	Small-quantity generators	Reportable quantities
Estimates of other harmful effects	None --briefly discussed	None - briefly discussed	None	None--briefly discussed
Estimates of costs	Engineering compliance costs and regulatory costs	Real resource costs from projected impacts on products markets	Engineering compliance costs and regulatory costs	Engineering compliance costs and regulatory costs
Cost-benefit comparisons in useful format	Useful table for proposed regulation, but comparison of alternative new regulations not included	Useful table presenting cost-effectiveness ratios for all alternatives	None given	Table for costs only for two alternative regulations

(continued)

TABLE ES-2. SUMMARY OF COMPARATIVE ANALYSIS OF EIGHT RIAs (continued)

Topic	Incineration	Land ban	Dioxins	Solvents
Nature of problem	Stack emissions from hazardous waste incinerators	Land-disposed wastes	Disposal of dioxin-containing wastes, especially land disposal	Disposal of solvent wastes, especially land disposal
Statutory authority	RCRA	RCRA	RCRA	RCRA
Regulatory alternatives	Some quantitative analysis for two alternative regulations	Quantitative analysis for four alternative regulations	Quantitative analysis for proposed regulation only	Quantitative analysis for two alternative regulations
Data sources used	Reporting data, survey data, case study data, industry data, estimates from EPA and other publications, and informed judgment; some sensitivity analysis	Survey data, estimates from EPA and other publications, and informed judgment; uncertainty analysis for exposure estimates	Reporting data, survey data, industry data, estimates from EPA and other publications, and informed judgment; uncertainty analysis for exposure estimates	Survey data, estimates from EPA and other publications, and informed judgments; some sensitivity analysis
Impacts in products markets	Not estimated	Not estimated	Not estimated	Not estimated
Exposure estimates	Number of people and steady-state exposure level in air; assumed 70-year exposure duration	Distribution of number of people and steady-state exposure levels in air, groundwater, and surface water; assumed 70-year exposure duration	Not presented	Number of people not estimated; average level and actual duration of exposure in air and groundwater; 70-year exposure duration assumed for health risk estimates
Estimates of cancer and other harmful health effects	Cancer cases for inhalation of air emissions from incinerators; potential to be above safe threshold for noncarcinogens	Cancer and noncancer cases for multiple disposal methods; weighted by severity factor	Cancer cases for multiple disposal methods; no estimates for noncarcinogens	Cancer cases for multiple disposal methods; exposure level relative to RFD for noncarcinogens
Estimates of other harmful effects	None	None--briefly discussed	None	None--briefly discussed

(continued)

TABLE ES-2. SUMMARY OF COMPARATIVE ANALYSIS OF EIGHT RIAs (continued)

Topic	Incineration	Land ban	Dioxins	Solvents
Estimates of costs	Engineering compliance costs	Engineering compliance costs	Engineering compliance costs	Engineering compliance costs
Cost-benefit comparisons in useful format	No; costs estimated for compliance with current regulations only: corresponding benefits not estimated	None given	No, discussion is inadequate	Compares percent change in costs to percent change in benefits. Does not look at absolute changes. Duration of disposal different for costs and benefits

and current management practices. The other half primarily use reporting data and previous EPA reports for their waste characterizations. Estimates from data provided in a report from a subcontractor or from a previous EPA report are used extensively as well as estimates from the research literature. Industry sources are used in many of the RIAs for data on current practices, costs, and resources available for cleanup programs.

All eight RIAs identify and discuss in some detail the markets that would be affected directly by the regulations. Impacts on market prices and output rates constitute "primary" economic impacts of regulations. Seven of the eight RIAs do not project these prices and output impacts at all. Of these seven, two explicitly state that price and output impacts are expected to be insignificant and are thus not projected. Others discuss price and output impacts qualitatively. The Used Oil RIA projects price and output impacts both in percentage and absolute terms.

"Secondary" market impacts include impacts on employment and impacts on capital utilization/industry growth. None of the eight RIAs quantitatively project employment impacts, though some do discuss possible impacts. Seven of the RIAs do not discuss potential impacts on existing or new capital at all. The Contingency Plan RIA does discuss possible changes in the cost of capital following regulation.

In the exposure analysis, the two CERCLA RIAs do not estimate actual release rates from the toxic chemical spills because the variability in size and chemical content was considered too great and the data too sparse to allow for adequate waste characterization. The RCRA RIAs all generate quantitative estimates of release rates from model waste streams to some or all of the media--air, groundwater, and surface water--for different waste disposal methods. Although the two CERCLA RIAs discuss releases to soil, none of the RCRA RIAs estimate exposures via soil contamination.

The number of persons exposed for each regulatory alternative is estimated in one CERCLA RIA (Contingency Plan) and all but one of the RCRA RIAs include estimates of the number of persons exposed. For the RCRA RIAs, estimates of exposure levels are obtained using release, fate, and transport models for air, groundwater, and surface water. Only two of these RIAs generate estimates for the duration of this exposure corresponding to a given

duration and method of waste disposal. All of the RCRA RIAs assume lifetime exposure for the health risk estimates for all disposal methods. Plant and animal exposure is discussed in only three of the RIAs and other environmental impacts are discussed in four.

The two CERCLA RIAs discuss health benefits but perform no quantitative estimates. The six RCRA RIAs all generate quantitative estimates of cancer risks attributable to the toxic chemicals for various disposal methods. Five out of six of these RIAs also generate quantitative estimates of noncancer risks attributable to the toxic chemicals for various disposal methods. All these estimates are used to determine the reduction in risk with the regulation. None generates quantitative estimates of other harmful effects, although most discuss such effects and the Solvents RIA assumes exposure ceases when the water concentration is above the taste-odor threshold because people switch to alternative water supplies. The costs associated with switching are not estimated, however.

None of the RIAs explicitly estimates the timing of avoided cancer or noncancer cases relative to the time of exposure. In some cases the issue is discussed briefly. In these RIAs, the cancer cases are assumed to occur over the next 70 years or, in one RIA, over the next 400 years. None of the RIAs attempts to estimate or even discuss a dollar value that might be associated with a case of environmentally induced cancer or other adverse health effect. None of the RIAs attempts to discount the avoided cancer cases and only one even discusses the issue of discounting health benefits. In three of the RCRA RIAs the results of either sensitivity or uncertainty analyses for the estimates of avoided cancer risks are presented.

For the cost estimates, all but one of the RIAs use estimates of engineering compliance costs to estimate the real resource costs of the regulation. In the Used Oil RIA, the results of the products markets analysis are used to estimate the real resource costs of the regulation. None of the RIAs estimates costs of unemployment or displacement of capital. The three RIAs that estimate the regulatory costs are those in which such costs are likely to be significant.

Most of the RIAs present some comparison of the benefits and costs of new regulations. The Reportable Quantities RIA estimates net-monetized benefits

but for changes in compliance costs only. The rest of the RIAs do not generate estimates of net-monetized benefits because health effects are not assigned a monetary value. However, in most cases some cost-effectiveness comparisons are attempted. These vary in their degree of quantification and in their clarity. In the Used Oil RIA, the ratio of annual dollar costs of the regulation to the annual number of avoided cancer cases is calculated. Annual avoided cancer cases are assumed equal to the avoided cancer cases for a single population cohort divided by 70. These ratios are used to compare regulatory alternatives. In the Contingency Plan RIA, although quantitative health effects are not generated, a useful tabular listing of benefits and costs is presented and discussed. The Small-Quantity Generators and Dioxins RIAs discuss the relationship between benefits and costs for different regulatory alternatives, but no attempt is made to quantify the relationship and no table is presented. The Solvents RIA compares the percentage reduction in cancer risks or noncarcinogenic exposure ratio with the percentage increase in compliance costs. The Incinerator RIA does not compare costs and benefits at all. The costs estimated are the compliance costs to move existing incinerators into compliance with the current regulations. Comparable benefits are not estimated, only health risks when complying with the current regulations and the health risks mandated by a possible alternative regulatory approach.

ES.3 SUGGESTIONS FOR IMPROVEMENT

Based on the framework outlined above and our comparative analysis of the eight RIAs, we have developed a set of specific suggestions of ways in which hazardous waste RIAs might conform more closely to EPA's guidelines in the future. These suggestions are described below under 12 general headings.

ES.3.1 Broader Perspective

The adverse effects of the releases of hazardous substances, in addition to health effects, should be discussed and, where possible, estimated. For example, if contaminated well water is detected, the health effects may be zero, but the costs of alternate water supplies and aquifer cleanup may be large. However, care must be taken to avoid double counting of adverse effects.

Releases to all relevant media should be estimated as well as all relevant routes of exposure from each medium. Thus, care should be taken to omit media or exposure routes from the benefits estimates only if their effects are likely to be insignificant.

ES.3.2 Quantitative Analysis of Several Alternatives

Future RIAs should generate quantitative estimates of benefits and costs for the proposed regulation and at least one regulatory alternative. The regulatory alternatives analyzed should represent significantly different approaches to that of the proposed regulation. These alternatives should be selected from those that have been considered during the regulatory development process. To the extent that only a narrow range of options was considered during regulatory development, the RIA will necessarily have a narrower scope.

ES.3.3 Derivation/Presentation of Input Parameter Values

Data sources should be described clearly and references included where appropriate. Survey data are a good, reliable source of data from industry. In RIAs that rely more heavily on reporting data, discussions of the limitations of that data and the likelihood and extent of under- or overreporting should be included. In RIAs that use estimates provided by a subcontractor, the primary data sources, whether industry sources, engineering estimates, or informed judgment, should be indicated so that the degree of certainty about the estimates may be ascertained.

Input parameter values should be tabulated for each estimation model used. Although uniformity in parameters estimates is not necessarily desirable or possible, all RIAs should include tables that list the values (or distributions) assumed for all input parameters so that the reader can easily compare the parameter values used in different RIAs.

ES.3.4 Methods for Cost Estimates

The effects of the regulation on the products markets should be described in an economic framework. For example, a supply/demand framework might be used.

The estimation method chosen should be selected on the basis of clearly defined decision rules. For example, such decision rules might be derived

using a simulation approach to determine when the more simplistic models are likely to misrepresent significantly the true costs of the regulation. The degree of misrepresentation might depend on the magnitude of the compliance costs relative to total industry costs and the elasticities of supply and demand in the products markets.

Cost estimates should include a broader definition of costs than industry compliance costs. For example, the degree to which these costs are passed on to the consumer as higher product prices should be estimated. Also, costs due to unemployment and dislocation of capital should be estimated.

ES.3.5 Products Markets Trends and Exposures

The regulations' compliance costs may change the volume of hazardous waste generated in future years. Such changes may change exposures and should be discussed and estimated if likely to be significant.

Some attempt should be made to incorporate into the analysis overall market trends for the affected industries. Such trends can have a major effect on the projected benefits and costs of a regulation over a multiyear period. For example, if generation of a hazardous waste is likely to decline in the future, the cost and exposure impacts of the regulation will be less than if more hazardous waste is likely to be generated.

ES.3.6 Release, Fate, and Transport Models

Use or develop transport models that allow variability in both level and duration of releases. For example, the Wilson and Miller Groundwater Transport model assumes a steady-state release whereas the PLUME and RANDOM WALK Groundwater Transport models are able to estimate exposure levels and durations that result from variable release levels and durations. The latter models or other similar models should therefore be used in future RIAs.

Make more realistic assumptions for models estimating releases of toxic chemicals from landfills for: degradation of the toxic chemicals in the landfill, concentration of toxic chemicals in leachate, concentration of toxic chemicals in free liquids, total volume of leachate, volume of leachate collected in leachate collection system, content of leachate collected in leachate collection system, and fate of leachate collected in leachate collection system. The existing models have either ignored or made overly simplistic assumptions about some of these factors (for example, no degradation of

the chemical in the landfill). Models estimating releases to groundwater should be reviewed carefully by EPA and an approach developed that explicitly deals with all the factors listed above as well as other relevant factors.

ES.3.7 People Affected by the Regulation

Distinguish between people affected by compliance activities and people affected because of changes in releases of the toxic chemical. Among those affected by compliance activities, include a discussion of the relative importance of business owners, employees, and consumers.

Develop a more consistent methodology for estimating the number of people exposed to contaminated groundwater, surface water, and soil. The RIAs analyzed vary greatly in the methods used to estimate the number of people exposed by route of exposure. Because this is a key variable in determining health effects, it might be useful for EPA to develop a methodology for population exposed to soil, surface water, and groundwater to complement the EPA GEMs Modeling System for air. In this way, a more consistent approach to this estimation would be encouraged for future RIAs.

ES.3.8 Realistic Timing

Choose a common period of waste disposal for the estimates of benefits and costs. Because the goal of an RIA is to enable comparison of the benefits and costs of new regulations, it is important that a common basis be used for estimating these benefits and costs. The most logical approach is to choose a period of waste disposal--either 1 year or 20 to 30 years--and compute the benefits and costs attributable to the new regulations for that disposal period. For a given disposal period, duration of release to the different media should also be estimated explicitly for different disposal methods. For example, releases to air from incineration occur only during the disposal period, while releases to groundwater from landfills may occur for up to 200 years after the end of the disposal period. Based on the duration of release to the environment, the duration of exposure from the different routes and disposal methods should also be estimated explicitly.

Discuss and present estimates, if possible, of the timing of the harmful health effects relative to time of exposure. There is an important difference in timing for cancers and noncancers that should, at a minimum, be discussed;

viz for cancers there is generally a long lag time after exposure (20 to 30 years) while noncancer effects may be experienced immediately. The lag time of the health effect determines the average age of the persons likely to experience the harmful health effects.

ES.3.9 Valuation of Health Benefits

Dollar valuation of health benefits should, at a minimum, be discussed in future RIAs. A large literature exists on the topic, and the EPA RIA guidelines describe appropriate methods that ~~can~~ be used to value both morbidity and mortality. Thus, it should also be possible to assign dollar values to the health benefits. An alternative approach is to estimate threshold values for the health benefits, at which values the benefits would just exceed the costs of the regulation.

ES.3.10 Benefit-Cost Comparisons

Comparisons of health effects with other dollar costs or benefits should be made for comparable durations of disposal. Annual costs, for example, should be compared to the change in health effects attributable to a single year of waste disposal. If this is not done, such cost-effectiveness estimates will be misleading for decisionmakers.

So that the decisionmaker will have information available in a useful format, the comparison of benefits and costs should be presented in a table as well as being discussed in the text. Both qualitative and quantitative estimates of the benefits and costs should be presented in this table so that the decisionmaker can make his/her own judgment about whether the unquantified benefits and costs are likely to be of sufficient importance as to change the decision he/she might make on the basis of the quantitative estimates alone. The discussion of the table should provide a summary of the implications of the entire analysis for the decisionmaker.

ES.3.11 Sensitivity/Uncertainty Analysis

Sensitivity analysis should be performed when there is considerable uncertainty about the values of some of the input parameters. For example, the results of the exposure impacts analysis and the dose-response relationships both are estimated with considerable uncertainty. Sensitivity analysis

should be performed for the exposure estimates and the dose-response relationships to provide information about the impact of changes in these parameter values. Full-scale uncertainty analysis should be used only to the extent that the results can be presented in a way that improves the decisionmaker's ability to make informed judgments.

ES.3.12 The RIA as a Complete Document

The RIA should include a combination of text and appendixes such that the results are reproducible by the reader from the RIA alone. Since the methods used for performing benefit-cost analyses for hazardous waste regulations are not standardized, it is important for all methods used to be described clearly. Equations should be presented in appendixes where appropriate. The results of each stage of the analysis should be presented in tabular form (e.g., waste characterization, release rates, and exposure concentrations) so that the reader can easily follow the steps of the estimation process. References to supporting documents cannot substitute for such detail within the RIA document, even if the bibliographical reference is complete. The supporting document may not be readily obtainable.

The text should avoid lengthy background discussions and should clearly and concisely present the benefit-cost analysis methodology and results. If more detailed discussion seems necessary (e.g., for the derivation of input parameter values), it should occur in an appendix. For example, only the summary of data derived from the industry profile should be included in the text. The industry profile should be presented in an appendix.

In order to facilitate the implementation of all these suggested improvements, we recommend that EPA prepare a reference handbook that would complement the RIA Guidelines. Such a handbook might include: a brief but detailed description of all relevant, currently used estimation models and a set of decision rules for choosing among them; for each estimation model, tables of commonly used input parameter values and their sources; and a listing of major data sources that might be useful for hazardous waste RIAs. The handbook also should present suggested refinements to currently used methods, where appropriate. The appendixes for the RCRA Risk-Cost Analysis Model and a more recent report Risk Assessment Methodology for Hazardous Waste Management provide a convenient starting point for such a reference work.

With the use of such EPA reference documents, the increase in resources needed to achieve all the improvements suggested above may not be large. Some of them involve only clearer presentation of the results of the analysis, including data sources and parameter values used (3), cost-benefit comparisons (9), and overall organization of the report (12). The other suggested improvements might require the use of additional models, but the burden on the preparer of the RIA can be minimized by developing a centralized listing of all such models and central access to the computer programs for them. Even if resource or data limitations prevent additional modeling, all these other suggested improvements can be addressed qualitatively, clearly presenting the methods used in the analysis and how more extensive modeling is likely to affect the results.